



Units of Measurements used in Civil Works

In any work, especially civil, in the planning and execution, measurement of the item plays an important role. At various places the method followed for the measurement is not uniform and slight ambiguity may lead to serious financial differences between the states. Sometimes, even in the same state different departments follow different methods. To standardise the methods of measurement of building and other civil engineering work IS:1200 (part I to XXV) has been framed by the Indian Standard Institution and hence in case of any discrepancy this IS: 1200 must be adhered to.

General Rules

1. Measurement shall be item wise and each item shall be fully described so that the work involved in item is self explanatory.
2. In booking dimensions, the order shall be in the sequence of length, breadth, height or depth or thickness.
3. All work shall be measured not subject to the tolerances unless otherwise stated.
 - (a) Dimension shall be measured to the nearest 0.01 meter i.e to 10 mm–1 cm
 - (b) Areas shall be measured to the nearest 0.01 sq.m.
 - (c) Cubic contents shall be worked up to the nearest 0.01 m

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4. Same type of work under different conditions and nature shall be measured separately under separate items.
5. The bill of quantities shall fully describe the item with materials, proportions, workmanship, etc.

Let us discuss the various items of work, especially of buildings, as regards to the units of measurement and payment. These are required for the preparation of estimates and finding out the cost and for actual payments after execution.

Excavation

The item of excavation is charged at the rate of per cubic metre and hence length, width and depth are measured. The length and width are measured as per the exact dimensions given on the drawings by the engineer. The depth is measured vertically at number of places and mean value is taken. No allowance is given for the working space. For large variations in depths, the area is divided into suitable sections and different depths are obtained for each section.

Lead and lift

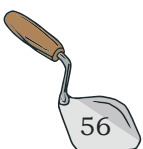
Measurement for excavation for every 1.50 m. depth is taken separately. Similarly, for different leads also, the measurements are taken separately. First lead to 50 m and lift of 1.50 m is included item. For further unit of lead and lift extra payment may be given. The lead should be measured from the centre of the area of excavation to the centre of area of the spoil heap. Similarly, lift should be measured from the centre of the excavation to the centre of the spoil heap.

Concrete

Concrete in general is also measured in cubic meters. Foundation concrete should be measured in cubic metre (cum), the length and width being same as in excavation. Depth is measured as per actual concrete laid.

RCC Work

Reinforced cement concrete (RCC) and plain cement concrete shall be taken separately but in cu.m. The



volume of reinforcement shall not be deducted. RCC Lintels, beams, columns shall be measured in cu.m. The ribs of beam projecting above or below the slab shall be taken for beam measurement. Height of column shall be measured upto the bottom of the beam.

RCC slabs upto 100 mm thickness, RCC *pardi*, partition walling *chhajja* shall be measured in square meters. RCC stair is measured in terms of numbers of steps. Half landing and quarter landing being taken as equivalent to four and two steps respectively. Damp proof course shall be taken in square meters with full description. Precast cement concrete work shall be taken in square meters with thickness specified for *jalli* work and louvers and in cu.m. meters for other cubical parts.

Brickwork

Brickwork is also measured in cubic metres for one brick wall and more thickness. Half brick wall and less than half brick wall should be measured in square metres. Brick work for arch should be measured separately in cubic metres. Walls are treated as solid without any opening, such as windows, doors, etc., for measurements. Then the deductions are made for all openings about 10% of the total calculated work.

No deduction or addition shall be made for the following:

- a) Opening up to 0.10 sq.m. in section
- b) Ends of joist, beams, lintel, posts rafters, purlins, corbels, steps, etc.
- c) Wall plates, bed plates, bearing plates, *chhajjas* and where the thickness does not exceed 10 cm and the bearing does not extend over the full thickness of wall.

Following special items of brickwork shall be measured separately — fire places, chimneys, etc., Pillars, arches, wall staining, reinforced brickwork, etc., shall be measured in cubic metres. Honeycomb brickwork, partition walls, should be measured in square metres. Moulding, cornices, string course, drip coarse, etc., should be measured in running metres.

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Toothing and bonding in square metre measured on the vertical face.

Stone Masonry

The stonework is measured in cubic metres. The full description regarding stone, mortar, proportion, etc. shall be given. Each type of stone masonry shall be taken separately. The thickness of wall should be measured to the nearest 10 mm. Deductions shall be same as in the item of brickwork. Stonework for the sill and copings of parapet shall be measured in running metres. The stonework for shelves, weather sheds and slabs shall be measured in square metres.

Woodwork

In case of woodwork the type of timber to be used and quality of finish to be used should be clearly mentioned in the item. The rate shall include fabrication, fixation, fastening, fixtures and three coats of oil paint.

The measurements are taken of the net work done and no consideration is given to the wastage of the material with a tolerance of 2 mm.

Steel and Iron Work

The unit in general is by weight, i.e. kg, quintal or tonne, and with full descriptions. Various items will be Rolled Steel Joist (RSJ), steel sections, structural steelwork, bolts, steel reinforcement, etc.

Roof Coverings

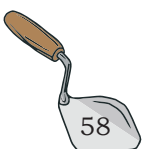
In general the unit is square metre (sq.m.), without any allowance for laps. Openings up to 0.40 sq.m. shall not be deducted. Ridges and hips shall be measured in running metre. Even the corrugated roofing shall be measured in sq.m. flat, not girthed.

Flooring and Pavings

These shall be measured in sq.m. with separate items for various types of floor finishes or pavings.

Skirting and dado

Up to 300 mm in height is measured in running metre and exceeding 300 mm in sq.m.



Plastering

Plastering is measured in sq.m. stating thickness, mortar and mix. External plasters shall be measured in stages of 3 m height. Plastering band 300 mm or below shall be measured in running metres.

Deductions

Rules that need to be followed are:

- a) No deductions will be made for ends of joist, beams, posts, etc. and openings not exceeding 0.5 sq.m. each and no additions will be made for reveals, jambs, soffits sills etc. of these openings not finishing plaster around ends of joists, beams, posts, etc.
- b) For opening exceeding 0.50 sq.m. but not exceeding 3 sq.m each deduction will be made for one face only and the other face will be allowed for jambs, soffits, sills which shall not be measured.
- c) When two faces are plastered with different mortar or if one side is plastered the other pointed, deduction will be made on the side of *chaukhat* of doors or windows on which the width of jambs or reveals is less than on the other side (Usually deduction is made for the outer face only).
- d) In case of openings of area 3 sq.m. each deduction shall be made for both faces of the openings and the jambs, reveals, soffits and sills shall be measured and added. In taking measurements of jambs, reveals, soffits and sills, *chaukhat* if any shall be neglected and the whole face shall be measured.

Moulded cornices, etc. shall be measured in running metres.

Pointing

Pointing will be taken in square metres and measured flat of the whole surface area. Deductions will be dealt in the same way as for plastering.

White Washing, Colour Washing and Distempering

All the works will be measured in sq.m. preparation of surface, cleaning etc. will also be included in the

item which includes path or spot repairs not exceeding 0.10 sq.m.

Deduction rules shall be the same as for plastering.

Multiplying factors for adding to the flat measurements of corrugated surfaces.

- Corrugated iron sheets — 14%
- Corrugated Asbestos cement sheets — 20%
- With large corrugations (viz. Big Six) — 10%
- Semi corrugated asbestos cement sheets (Viz. Trafford Sheets) — 10%

Painting

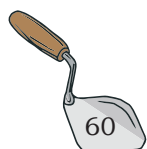
Painting will be measured in sq.m. stating number of coats and measured flat. The items include the preparation of surface, cleaning, rubbing, etc.

Corrugated surface will be dealt with same as white washing. Painting of doors and windows will be measured, closed and flat in sq.m.

The coefficients or multiplying factors for different surfaces to get equivalent plain area are as given below.

Coefficients or multiplying factors for different surfaces

S.No.	Doors and Windows	Multiplying factors
1.	Panelled, Framed and Braced Lugged and Battened, Lugged Battened and Braced	1.125 each side
2.	Fully glazed or gauged	$\frac{1}{2}$ for each side
3.	Part panelled and glazed or gauged	1 for each side
4.	Flush doors	1 for each side
5.	Flush venetioned or louvered miscellaneous works	1.50 for each side
6.	Roof battens (openings not to be deducted)	for all over $\frac{3}{4}$
7.	Jaffri work one or two way	2 for all over (No deductions for opening)
8.	Balustrades, grills, grating, railing,	1 for all over x-per meter (No deduction for opening)
9.	Steel Rolling shutters	1.25 for each side
10.	For corrugated iron, asbestos sheets, etc., same as for white washing, etc.	1.14 1.10 1.20 For each side



Painting upto 150 mm in width or in girth will be measured in running metre.

Painting trusses, compound girders, and other such works will be measured in sq.m. and measurement of perimeter and length shall be taken to get the area.

Painting on eaves, gutters, pipes, poles, etc. shall be measured in running metre.

Coal tarring, varnishing and polishing shall be measured similar to painting.

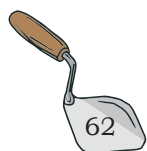
List of Units of Measurements and Payments for Various Items of Work and Material in a Tabular Form

Let us summarise and prepare the list of units of measurements and payments for various items of work and material in a tabular form.

Description	Units of	
	Measurement	Payment
1	2	3
Earth work		
1. Earth work in excavation for foundation in all sorts of soil	cu.m.	Per cu.m.
2. All types of filing in plinth and elsewhere	cu.m.	Per cu.m.
Concrete		
1. Plain or Reinforced cement concrete lime concrete for almost all component parts	cu.m.	Per cu.m.
2. Thin RCC members viz. slab, <i>pardis</i> etc.	sq.m.	Per sq.m.
3. Damp Proof Courses (DPC)	sq.m.	Per sq.m.
Brickwork		
1. Brickwork in general for foundation, plinth, super structure etc.	cu.m.	Per cu.m.
2. Brickwork for half brick walls and thinner walls	sq.m.	Per sq.m.
3. Lengthwise courses, such as string course, drip, weather courses cornice, etc.	Intre	Per m.
Stonework		
1. Stone masonry UCER, CR and all types	cu.m.	Per cu.m.
2. Cut stone work in lintel, beams, etc.	cu.m.	Per cu.m.
3. Stone slabs in roof, shelves wall	sq.m.	Per sq.m.

Woodwork		
1. Woodwork for doors and windows frames, roof, components of trusses, wall plate etc.	cu.m.	Per cu.m.
2. Door and window shutters, partition, plywood etc.	sq.m.	Per sq.m.
3. Ballies specifying diameter	m.	Per m.
Steelwork		
1. Almost all steelwork viz. RSJ various sections, Reinforcement bars etc.	Quintal or tonne	Per q.T. (by weight)
2. Grillwork, X-pm, collapsible, rolling shutter doors and windows	sq.m.	Per sq.m.
3. Railing CI pipes	m.	Per m.
Roofing		
1. Roofing in general viz. tiled roof, cl, or asbestos, sheeting, eaves board, ceiling	sq.m.	Per sq.m.
2. RCC slabs	cu.m.	Per cu.m.
3. Ridges, valleys, gutters, etc.	m.	Per m.
Plastering, pointing and finishing		
1. All in general	sq.m.	Per sq.m.
2. Skirting upto 300 mm ht.	m.	Per m.
Flooring		
1. All types of flooring	sq.m.	Per sq.m.
Material		
1. Supply of bricks	1000 nos.	Per 1000 nos.
2. Supply of sand, muram, metal timber, etc.	cu.m	Per cu.m.
3. Supply of cement and lime	Bag or by weight	Per bag per quintal or Ton
4. Supply of steel, .GI Sheets	Quintal	Per quintal
5. Supply of electrical units such, as switches, plugs, bulbs, brackets, etc.	Number	Per no.
6. Supply of sanitary units and water supply units such as wash basin, sinks, WC pans, Taps, valves, etc.	Number	Per no.
7. Supply of pipes – CI S.W. AC, etc.	Metre	Per m.
8. Supply of paint, varnish oil etc.	Litre	Per L.

Note: Sq. m. = Square metre, Cu.m. = Cubic metre



Practical Activity

1. Measure the different items of a single room with measuring tape or any other measuring tool and record in a tabular format.

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Check Your Progress

A. Write down the units used for the following items of work

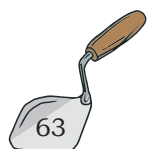
1. Earthwork in excavation
2. Brickwork in superstructure
3. Railing CI Pipes
4. Flooring
5. Stone masonry
6. Skirting
7. Supply of paint
8. Frames of doors and windows
9. Wooden stairs
10. Plastering and Pointing
11. Steel reinforcement
12. Damp proof course

B. Fill in the blanks with appropriate measurement units

1. Wooden beams and posts, rectangular in section _____.
2. Frames of doors, windows, cupboards, ventilators etc. _____.
3. Component parts of wooden trusses _____.
4. Shutters of doors, windows etc. _____.
5. Roof battens _____.
6. Ballies, cornices, picture rails, architraves etc. _____.
7. Wooden stairs _____.

C. Multiple choice questions

1. The rate of an item of work depends upon _____.
(a) Specification of work
(b) Specification of materials
(c) Proportion of mortar
(d) All of these
2. Brick wall is measured in sq.m. if thickness of wall is _____.
(a) 15 cm
(b) 10 cm
(c) 20 cm
(d) None of these
3. While estimating the quantities for the construction of a building the correct metric unit is _____.
(a) metre for length
(b) cubic metre for area
(c) square metre for volume
(d) litre for capacity



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4. The brickwork is not measured in cu.m. in case of _____.
- (a) one or more than one brick wall
 - (b) brick work in arches
 - (c) reinforced brick work
 - (d) half brick wall
5. Which of the following item of earthwork is not measured separately?
- (a) Setting out of work
 - (b) Site clearance
 - (c) Steps in deep excavation
 - (d) All of these
6. The measurement is made in square metre in case of _____.
- (a) cement concrete in foundation
 - (b) RCC structure
 - (c) hollow concrete block
 - (d) None of these
7. Up to _____ height of dado is measured in running metre.
- (a) 300 mm
 - (b) 330 mm
 - (c) 315 mm
 - (d) 325 mm

